MULTIMEDIA UNIVERSITY

STUDENT ID NO

SEAT NO

VENUE:_____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

PMT0301 – MATHEMATICS III

(All sections/ Groups)

26th MAY 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

Question	Marks
1	/10
2	/10
3	/10
4	/10
Total	/40

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **NINE** printed pages excluding cover page, formulae list and statistical table.

2. Answer **ALL** FOUR questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the **QUESTION BOOKLET**. All necessary working steps **MUST** be shown.

Question 1

(a) Find two unit vectors orthogonal to both $\langle 1,-1,1 \rangle$ and $\langle 0,4,4 \rangle$.

[3 marks]

(b) Find an equation of the plane that is perpendicular to the plane $8x-2y+6z=1$ and passes through the points $P_1(-1, 2, 5)$ and $P_2(2, 1, 4)$.

[3 marks]

Continue…

(c) Find the sum of the geometric series $1+3+9+...+2187$. [3 marks]

(d) Find the term that contains x^7 in the expansion of $(x-3y)^9$. [1 mark]

Continue...

Question 2

(a) Given the following system of linear equations:

$$x + 2y - z = -2$$
$$x + 4y - 2z = -5$$
$$2x + 3y + z = -5$$

Find the inverse matrix by using its adjoint, and hence solve the system of linear equations by using inverse method.

[5 marks]

Continue…

(b) The following table shows the amount of protein (in grams) for a variety of burgers from selected fast-food restaurants in Klang Valley.

Protein (in grams)	Number of burgers
12-19	7
20-27	17
28-35	10
36-43	4
44-51	1
52-59	1

(i) Compute the midpoints, class boundaries, $\sum mf$ and $\sum m^2 f$. [2 marks]

(ii) Calculate the mean. Give your answer correct to 2 decimal places. [1 mark]

Continue...

(iii) Calculate the mode. Give your answer correct to 2 decimal places.

[2 marks]

Question 3

(a) Based on past experiences, a stockbroker believes that under present economic conditions a client will invest in stocks with a probability of 0.55, will invest in mutual funds with a probability of 0.3, and will invest in both stocks and mutual funds with a probability of 0.15. Find the probability that a client will invest

(i) in either stocks or mutual funds. [1.5 marks]

(ii) in neither stocks nor mutual funds. [1.5 marks]

(b) A random sample of 200 lecturers is classified below by gender and academic qualification.

Academic Qualification \ Gender	Male	Female
Bachelor's degree	48	47
Master's degree	35	43
PhD's degree	12	15

(i) If a lecturer is chosen at random, find the probability that the lecturer is a male with Bachelor's degree? [1 mark]

Continue…

(ii) If a lecturer is chosen at random, find the probability that the lecturer does not have a PhD's degree, given that the lecturer is a female.

[2 marks]

(iii) Are events 'Bachelor's degree' and 'Male' independent? Explain your answer.

[4 marks]

Continue…

Question 4

(a) A study shows that 15% of the population in a country wear spectacles. A random sample of 20 persons is selected from this country.

(i) Find the probability that at least 2 persons in this sample wear spectacles.

[3 marks]

(ii) What is the standard deviation of the number of persons who wear spectacles? [2 marks]

(b) On average, there are 3 customers enter a laundry shop every 30 minutes. Find the probability that less than 3 customers enter the shop in a given 1 hour period.

[2 marks]

Continue...

(c) The distribution of the time taken for a machine to produce one product is known to be Normal with mean 45 minutes and standard deviation 15 minutes. Find the probability that the machine will take between 30 to 50 minutes to produce one product. [3 marks]

End of Page

FORMULAE LIST

Vector

Dot Product:

$$\mathbf{u}\cdot\mathbf{v}=u_1v_1+u_2v_2+u_3v_3 \quad \text{or} \quad \mathbf{u}\cdot\mathbf{v}=\|\mathbf{u}\|\|\mathbf{v}\|\cos\theta$$

Cross Product:

$$\mathbf{u}\times\mathbf{v}=\begin{vmatrix}\mathbf{i}&\mathbf{j}&\mathbf{k}\\u_1&u_2&u_3\\v_1&v_2&v_3\end{vmatrix}=\begin{vmatrix}u_2&u_3\\v_2&v_3\end{vmatrix}\mathbf{i}-\begin{vmatrix}u_1&u_3\\v_1&v_3\end{vmatrix}\mathbf{j}+\begin{vmatrix}u_1&u_2\\v_1&v_2\end{vmatrix}\mathbf{k}$$

Line Equation in 3D space:

$$\mathbf{r}=\mathbf{r}_0+t\mathbf{v}$$

Plane Equation in 3D space:

$$\mathbf{n}.(\mathbf{r}-\mathbf{r}_0)=0$$

Mode

$$L+\left[\frac{f_m-f_B}{(f_m-f_A)+(f_m-f_B)}\right]c$$

Median

$$L+\left(\frac{\frac{\sum f}{2}-f_L}{f_m}\right)c$$

Mean

Ungrouped Data		Grouped Data	
Sample	**Population**	**Sample**	**Population**
$\bar{x}=\frac{\sum x}{n}$	$\mu=\frac{\sum x}{N}$	$\bar{x}=\frac{\sum mf}{\sum f}$	$\mu=\frac{\sum mf}{\sum f}$

Variance

Ungrouped Data	
Sample	**Population**
$s^2=\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1}$	$\sigma^2=\frac{\sum x^2-\frac{(\sum x)^2}{N}}{N}$
Grouped Data	
Sample	**Population**
$s^2=\frac{\sum m^2f-\frac{(\sum mf)^2}{\sum f}}{\sum f-1}$	$s^2=\frac{\sum m^2f-\frac{(\sum mf)^2}{\sum f}}{\sum f}$

Conditional Probability

$$P(A|B)=\frac{P(A\cap B)}{P(B)}$$

Independent Event

$$P(A|B)=P(A) \text{ or } P(B|A)=P(B) \text{ or } P(A\cap B)=P(A)\cdot P(B)$$

Binomial

$$P(X=x)=\binom{n}{x}p^xq^{n-x} \quad ; \quad \mu=np \quad ; \quad \sigma=\sqrt{npq}$$

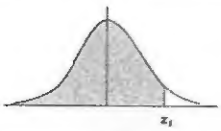
Poisson

$$P(X=x)=\frac{\lambda^x e^{-\lambda}}{x!} \quad ; \quad \mu=\lambda \quad ; \quad \sigma=\sqrt{\lambda}$$

Standard Normal

$$z=\frac{x-\mu}{\sigma}$$

Standard Normal Distribution



$$p(z \le z_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_1} e^{-\frac{1}{2}z^2} dz$$

The Normal Distribution Function

x	Φ(X)	x	Φ(X)	x	Φ(X)	x	Φ(X)
0.00	0.5000	0.50	0.6915	1.00	0.8413	1.50	0.9332
0.01	0.5040	0.51	0.6950	1.01	0.8438	1.51	0.9345
0.02	0.5080	0.52	0.6985	1.02	0.8461	1.52	0.9357
0.03	0.5120	0.53	0.7019	1.03	0.8485	1.53	0.9370
0.04	0.5160	0.54	0.7054	1.04	0.8508	1.54	0.9382
0.05	0.5199	0.55	0.7088	1.05	0.8531	1.55	0.9394
0.06	0.5239	0.56	0.7123	1.06	0.8554	1.56	0.9406
0.07	0.5279	0.57	0.7157	1.07	0.8577	1.57	0.9418
0.08	0.5319	0.58	0.7190	1.08	0.8599	1.58	0.9429
0.09	0.5359	0.59	0.7224	1.09	0.8621	1.59	0.9441
0.10	0.5398	0.60	0.7257	1.10	0.8643	1.60	0.9452
0.11	0.5438	0.61	0.7291	1.11	0.8665	1.61	0.9463
0.12	0.5478	0.62	0.7324	1.12	0.8686	1.62	0.9474
0.13	0.5517	0.63	0.7357	1.13	0.8708	1.63	0.9484
0.14	0.5557	0.64	0.7389	1.14	0.8729	1.64	0.9495
0.15	0.5596	0.65	0.7422	1.15	0.8749	1.65	0.9505
0.16	0.5636	0.66	0.7454	1.16	0.8770	1.66	0.9515
0.17	0.5675	0.67	0.7486	1.17	0.8790	1.67	0.9525
0.18	0.5714	0.68	0.7517	1.18	0.8810	1.68	0.9535
0.19	0.5753	0.69	0.7549	1.19	0.8830	1.69	0.9545
0.20	0.5793	0.70	0.7580	1.20	0.8849	1.70	0.9554
0.21	0.5832	0.71	0.7611	1.21	0.8869	1.71	0.9564
0.22	0.5871	0.72	0.7642	1.22	0.8888	1.72	0.9573
0.23	0.5910	0.73	0.7673	1.23	0.8907	1.73	0.9582
0.24	0.5948	0.74	0.7704	1.24	0.8925	1.74	0.9591
0.25	0.5987	0.75	0.7734	1.25	0.8944	1.75	0.9599
0.26	0.6026	0.76	0.7764	1.26	0.8962	1.76	0.9608
0.27	0.6064	0.77	0.7794	1.27	0.8980	1.77	0.9616
0.28	0.6103	0.78	0.7823	1.28	0.8997	1.78	0.9625
0.29	0.6141	0.79	0.7852	1.29	0.9015	1.79	0.9633
0.30	0.6179	0.80	0.7881	1.30	0.9032	1.80	0.9641
0.31	0.6217	0.81	0.7910	1.31	0.9049	1.81	0.9649
0.32	0.6255	0.82	0.7939	1.32	0.9066	1.82	0.9656
0.33	0.6293	0.83	0.7967	1.33	0.9082	1.83	0.9664
0.34	0.6331	0.84	0.7995	1.34	0.9099	1.84	0.9671
0.35	0.6368	0.85	0.8023	1.35	0.9115	1.85	0.9678
0.36	0.6406	0.86	0.8051	1.36	0.9131	1.86	0.9686
0.37	0.6443	0.87	0.8078	1.37	0.9147	1.87	0.9693
0.38	0.6480	0.88	0.8106	1.38	0.9162	1.88	0.9699
0.39	0.6517	0.89	0.8133	1.39	0.9177	1.89	0.9706
0.40	0.6554	0.90	0.8159	1.40	0.9192	1.90	0.9713
0.41	0.6591	0.91	0.8186	1.41	0.9207	1.91	0.9719
0.42	0.6628	0.92	0.8212	1.42	0.9222	1.92	0.9726
0.43	0.6664	0.93	0.8238	1.43	0.9236	1.93	0.9732
0.44	0.6700	0.94	0.8264	1.44	0.9251	1.94	0.9738
0.45	0.6736	0.95	0.8289	1.45	0.9265	1.95	0.9744
0.46	0.6772	0.96	0.8315	1.46	0.9279	1.96	0.9750
0.47	0.6808	0.97	0.8340	1.47	0.9292	1.97	0.9756
0.48	0.6844	0.98	0.8365	1.48	0.9306	1.98	0.9761
0.49	0.6879	0.99	0.8389	1.49	0.9319	1.99	0.9767
0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772

x	Φ(X)	x	Φ(X)	x	Φ(X)	x	Φ(X)
2.00	0.97725	2.50	0.99379	3.00	0.99865	3.50	0.99977
2.01	0.97778	2.51	0.99396	3.01	0.99869	3.51	0.99978
2.02	0.97831	2.52	0.99413	3.02	0.99874	3.52	0.99978
2.03	0.97882	2.53	0.99430	3.03	0.99878	3.53	0.99979
2.04	0.97932	2.54	0.99446	3.04	0.99882	3.54	0.99980
2.05	0.97982	2.55	0.99461	3.05	0.99886	3.55	0.99981
2.06	0.98030	2.56	0.99477	3.06	0.99889	3.56	0.99981
2.07	0.98077	2.57	0.99492	3.07	0.99893	3.57	0.99982
2.08	0.98124	2.58	0.99506	3.08	0.99896	3.58	0.99983
2.09	0.98169	2.59	0.99520	3.09	0.99900	3.59	0.99983
2.10	0.98214	2.60	0.99534	3.10	0.99903	3.60	0.99984
2.11	0.98257	2.61	0.99547	3.11	0.99906	3.61	0.99985
2.12	0.98300	2.62	0.99560	3.12	0.99910	3.62	0.99985
2.13	0.98341	2.63	0.99573	3.13	0.99913	3.63	0.99986
2.14	0.98382	2.64	0.99585	3.14	0.99916	3.64	0.99986
2.15	0.98422	2.65	0.99598	3.15	0.99918	3.65	0.99987
2.16	0.98461	2.66	0.99609	3.16	0.99921	3.66	0.99987
2.17	0.98500	2.67	0.99621	3.17	0.99924	3.67	0.99988
2.18	0.98537	2.68	0.99632	3.18	0.99926	3.68	0.99988
2.19	0.98574	2.69	0.99643	3.19	0.99929	3.69	0.99989
2.20	0.98610	2.70	0.99653	3.20	0.99931	3.70	0.99989
2.21	0.98645	2.71	0.99664	3.21	0.99934	3.71	0.99990
2.22	0.98679	2.72	0.99674	3.22	0.99936	3.72	0.99990
2.23	0.98713	2.73	0.99683	3.23	0.99938	3.73	0.99990
2.24	0.98745	2.74	0.99693	3.24	0.99940	3.74	0.99991
2.25	0.98778	2.75	0.99702	3.25	0.99942	3.75	0.99991
2.26	0.98809	2.76	0.99711	3.26	0.99944	3.76	0.99992
2.27	0.98840	2.77	0.99720	3.27	0.99946	3.77	0.99992
2.28	0.98870	2.78	0.99728	3.28	0.99948	3.78	0.99992
2.29	0.98899	2.79	0.99736	3.29	0.99950	3.79	0.99992
2.30	0.98928	2.80	0.99744	3.30	0.99952	3.80	0.99993
2.31	0.98956	2.81	0.99752	3.31	0.99953	3.81	0.99993
2.32	0.98983	2.82	0.99760	3.32	0.99955	3.82	0.99993
2.33	0.99010	2.83	0.99767	3.33	0.99957	3.83	0.99994
2.34	0.99036	2.84	0.99774	3.34	0.99958	3.84	0.99994
2.35	0.99061	2.85	0.99781	3.35	0.99960	3.85	0.99994
2.36	0.99086	2.86	0.99788	3.36	0.99961	3.86	0.99994
2.37	0.99111	2.87	0.99795	3.37	0.99962	3.87	0.99995
2.38	0.99134	2.88	0.99801	3.38	0.99964	3.88	0.99995
2.39	0.99158	2.89	0.99807	3.39	0.99965	3.89	0.99995
2.40	0.99180	2.90	0.99813	3.40	0.99966	3.90	0.99995
2.41	0.99202	2.91	0.99819	3.41	0.99968	3.91	0.99995
2.42	0.99224	2.92	0.99825	3.42	0.99969	3.92	0.99996
2.43	0.99245	2.93	0.99831	3.43	0.99970	3.93	0.99996
2.44	0.99266	2.94	0.99836	3.44	0.99971	3.94	0.99996
2.45	0.99286	2.95	0.99841	3.45	0.99972	3.95	0.99996
2.46	0.99305	2.96	0.99846	3.46	0.99973	3.96	0.99996
2.47	0.99324	2.97	0.99851	3.47	0.99974	3.97	0.99996
2.48	0.99343	2.98	0.99856	3.48	0.99975	3.98	0.99997
2.49	0.99361	2.99	0.99861	3.49	0.99976	3.99	0.99997
2.50	0.99379	3.00	0.99865	3.50	0.99977	4.00	0.99997